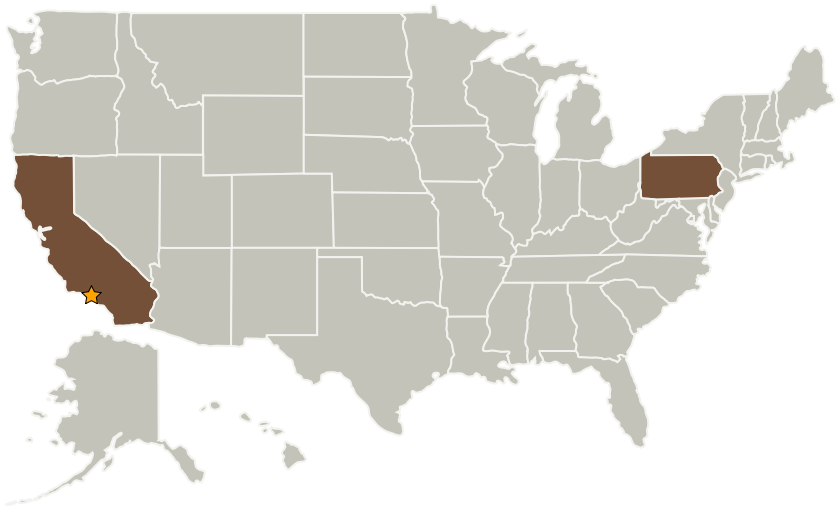
High Temperature Electrostrictive Ceramics, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

TRS Technologies proposes to develop high temperature electrostrictors from bismuth-based ferroelectrics. These materials will exhibit high strain and low loss in the 400 to 500°C temperature range, enabling the development of robotic components such as high power ultrasonic transducers and high force actuators for NASA?s planned missions to Venus. Such devices are currently made from piezoelectric Pb(Zr,Ti)O3 ceramic (PZT), which does not operate above 350?C. Existing high temperature piezoelectrics (such lead titanate and quartz) are only useful for sensor applications. They do not have high enough properties or low enough electromechanical loss for actuators and transducers. Electrostrictive materials have been successively used for high precision positioning actuators and high power sonar projectors. They have inherently low losses regardless of operating temperature. The materials developed on Phase I will be specifically designed to operate at 460?C, the Venus surface temperature. Other types of actuators such as pneumatic, hydraulic, electro-active polymer, and shape memory alloy will be difficult if not impossible to implement at such high temperature. In the Phase I program TRS will fabricate 460°C electrostrictors and demonstrate their feasibility for transducers and actuators with strain vs. field measurements. Actuators and ultrasonic devices will be developed in Phase II.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
TRS Ceramics, Inc.	Supporting Organization	Industry	State College, Pennsylvania

Primary U.S. Work Locations	
California	Pennsylvania

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Edward Alberta

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.1 Photovoltaic